


Fig. 1

26 

TIME STAMP DATA		FLOW ACTIVITY RECORDS	
START TIME	END TIME OR DURATION	FLOW DESCRIPTOR	PERFORMANCE METRICS
t ₁		fd ₁	pm ₁
t ₂		fd ₂	pm ₂
⋮		⋮	⋮
t _n		fd _n	pm _n

Fig. 2
(Prior Art)

3/11

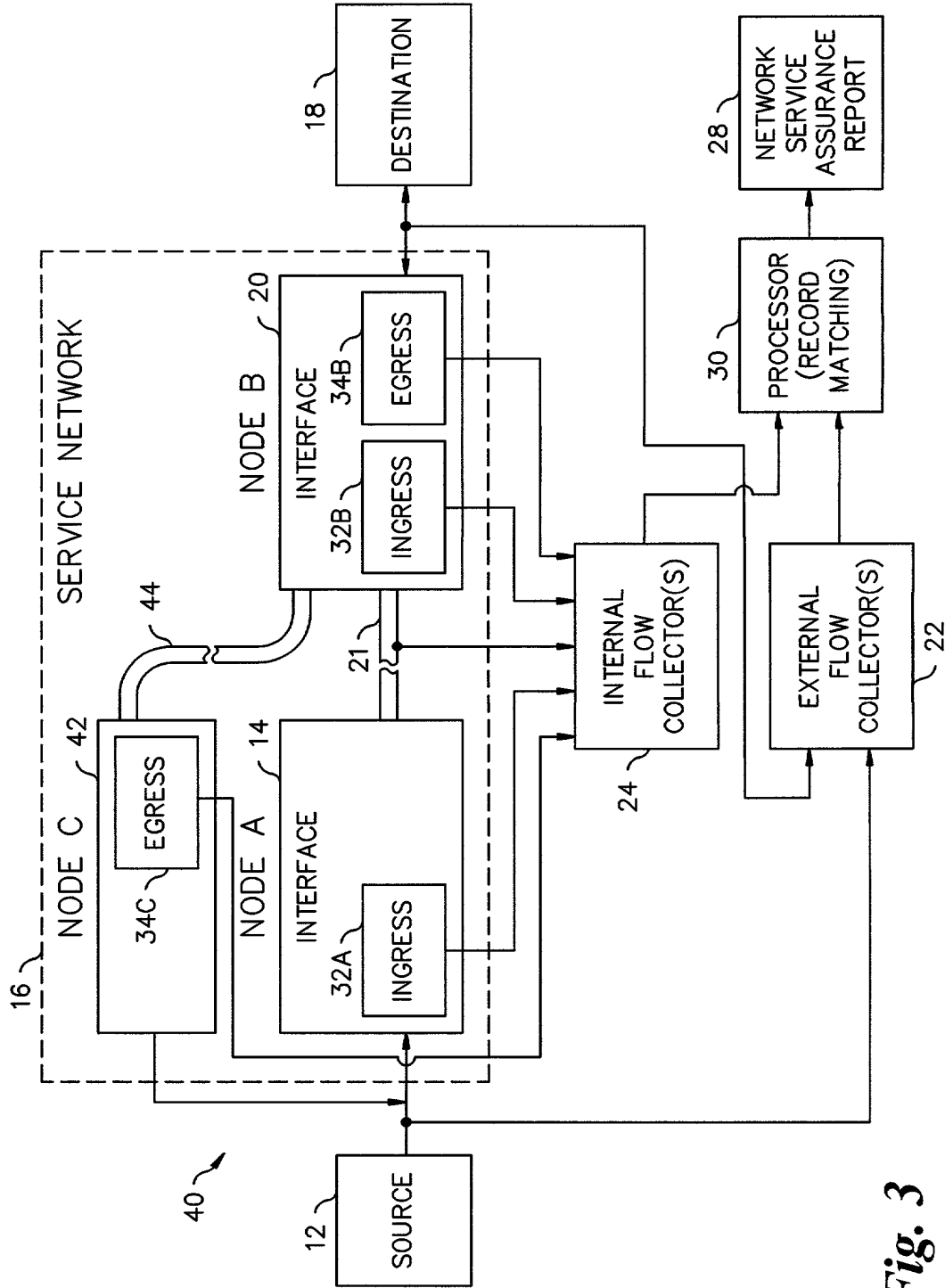


Fig. 3

FIG. 3

4/11

EXAMPLE (ALL FOR fd_1)	EXTERNAL FLOW COLLECTOR (TOTAL PACKETS)		INTERNAL FLOW COLLECTOR (TOTAL PACKETS)		EXTERNAL FLOW COLLECTOR (TOTAL PACKETS)	DATA ANALYSIS
	SOURCE EGRESS	SERVICE NETWORK INGRESS	SERVICE NETWORK INGRESS	SERVICE NETWORK EGRESS		
1	14	14	14	14	14	NO LOSS LOSS IN SERVICE NETWORK LOSS OUTSIDE OF SERVICE NETWORK LOSS INSIDE AND OUTSIDE OF SERVICE NETWORK LOSS OUTSIDE OF SERVICE NETWORK WITH ALTERNATE PATH INTO SERVICE NETWORK LOSS OUTSIDE OF SERVICE NETWORK WITH ALTERNATE PATH AROUND SERVICE NETWORK
2	10	10	10	9	9	
3	10	9	9	9	9	
4	14	11	10	10	10	
5	10	5	5	10	10	LOSS OUTSIDE OF SERVICE NETWORK WITH ALTERNATE PATH AROUND SERVICE NETWORK
6	10	5	5	5	10	

Fig. 4

Fig. 5

Fig. 5

EXAMPLE	EXTERNAL FLOW COLLECTOR	INTERNAL FLOW COLLECTOR		EXTERNAL FLOW COLLECTOR	DESTINATION REACHABLE?
	SOURCE EGRESS	SERVICE NETWORK INGRESS	SERVICE NETWORK EGRESS	DESTINATION INGRESS	
1	fd ₁	fd ₁	fd ₁	fd ₁	YES
2	fd ₁	fd ₁	fd ₁	no fd ₁	NO
3	fd ₁	fd ₁	no fd ₁	no fd ₁	NO
4	fd ₁	no fd ₁	no fd ₁	no fd ₁	NO
5	fd ₁	no fd ₁	no fd ₁	fd ₁	YES

Fig. 6

EXAMPLE	EXTERNAL FLOW COLLECTOR	INTERNAL FLOW COLLECTOR	CONNECTIVITY?
	SOURCE	SERVICE NETWORK	
1	fd ₁ (i, e)	fd ₁ (i, e)	YES
2	fd ₁ (no i, e)	fd ₁ (i, no e)	NO
3	fd ₁ (no i, e)	fd ₁ (i, e)	NO

Fig. 7

NETWORK ROUND-TRIP DELAY FROM MATCHED FLOW RECORDS

SPECIFIC CALCULATION	DESCRIPTION	METHOD
RTT ₁	TOTAL NETWORK DELAY (dT ₁ + dT ₂ + dT ₃)	TIME DURATION (FR _{E1}) - TIME DURATION (FR _{E2})
RTT ₂	NON REMOTE NETWORK DELAY (dT ₁ + dT ₂)	TIME DURATION (FR _{E1}) - TIME DURATION (FR _{I2})
RTT ₃	NON LOCAL NETWORK DELAY (dT ₂ + dT ₃)	TIME DURATION (FR _{I1}) - TIME DURATION (FR _{E2})
RTT ₄	LOCAL NETWORK DELAY (dT ₁)	TIME DURATION (FR _{E1}) - TIME DURATION (FR _{I1})
RTT ₅	SERVICE NETWORK DELAY (dT ₂)	TIME DURATION (FR _{I1}) - TIME DURATION (FR _{I2})
RTT ₆	REMOTE NETWORK DELAY (dT ₃)	TIME DURATION (FR _{I2}) - TIME DURATION (FR _{E2})

Time Duration(FR_X) = FR_{LastTime} * - FR_{StartTime} †

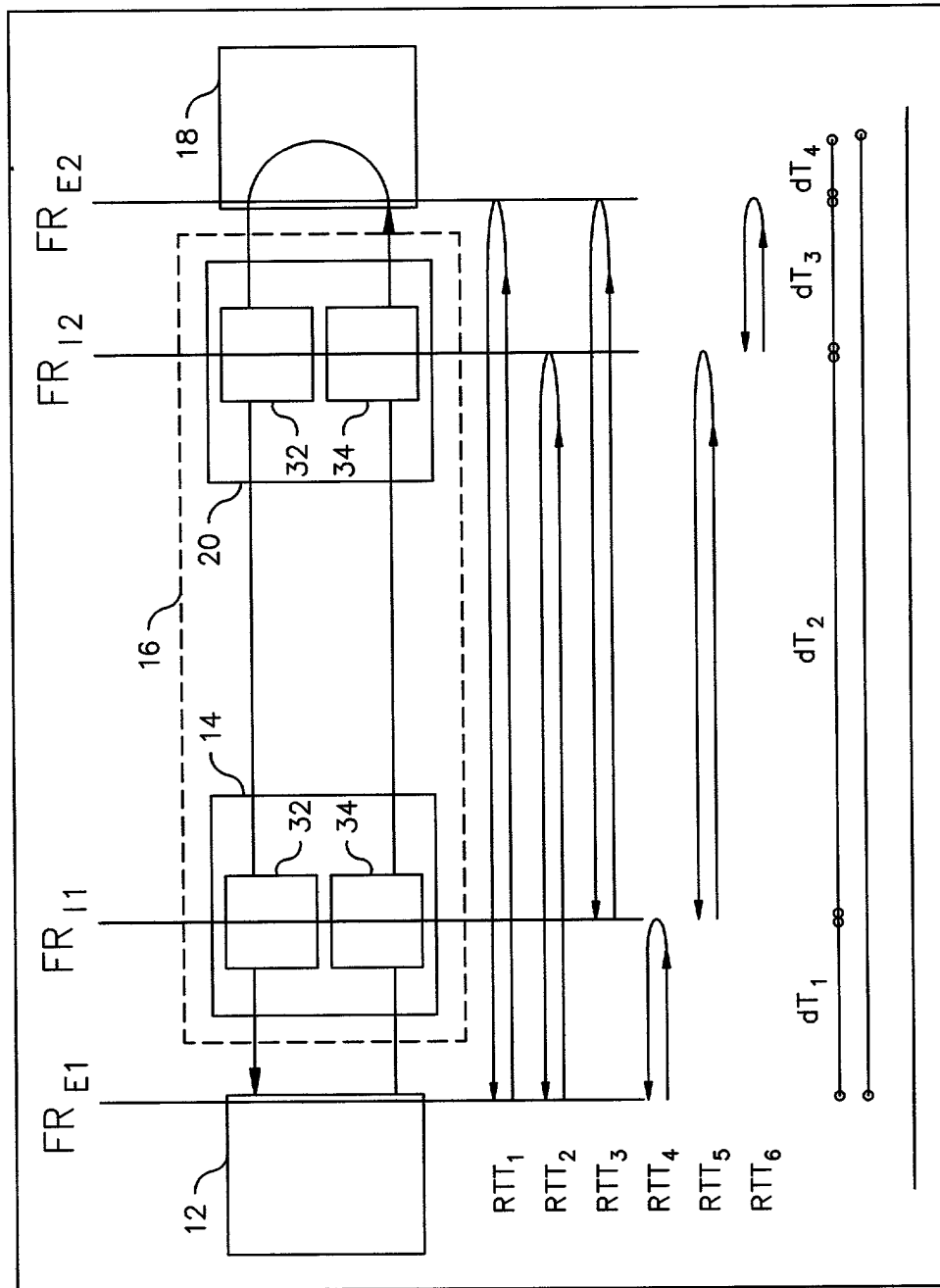
Time Duration(FR_X) = FR_{Duration}

† TIME REPRESENTS THE TIMESTAMP OF THE FIRST PACKET TRANSMITTED FROM THE SOURCE TO THE DESTINATION.

* TIME REPRESENTS THE TIMESTAMP OF THE LAST PACKET TRANSMITTED FROM THE DESTINATION TO THE SOURCE.

Fig. 8A

Fig. 8B



ONE-WAY DELAY DETERMINATION FROM MATCHED FLOW RECORDS

SPECIFIC CALCULATION	DESCRIPTION	METHOD
OWD ₁	LOCAL NETWORK EGRESS DELAY	StartTime (FR ₁₁) - StartTime (FR _{E1})
OWD ₂	SERVICE NETWORK INGRESS DELAY	StartTime (FR ₁₂) - StartTime (FR ₁₁)
OWD ₃	REMOTE NETWORK INGRESS DELAY	StartTime (FR _{E2}) - StartTime (FR ₁₂)
OWD ₄	REMOTE NETWORK EGRESS DELAY	LastTime (FR ₁₂) - LastTime (FR _{E2})
OWD ₅	SERVICE NETWORK EGRESS DELAY	LastTime (FR ₁₁) - LastTime (FR ₁₂)
OWD ₆	LOCAL NETWORK INGRESS DELAY	LastTime (FR _{E1}) - LastTime (FR ₁₁)

$$\text{StartTime}(\text{FR}_X) = \text{FR}_{\text{StartTime}}^{\dagger}$$

$$\text{LastTime}(\text{FR}_X) = \text{FR}_{\text{LastTime}}^{*}$$

$$\text{LastTime}(\text{FR}_X) = \text{FR}_{\text{StartTime}}^{\dagger} + \text{FR}_{\text{Duration}}^{*}$$

† TIME REPRESENTS THE TIMESTAMP OF THE FIRST PACKET TRANSMITTED FROM THE SOURCE TO THE DESTINATION.

* TIME REPRESENTS THE TIMESTAMP OF THE LAST PACKET TRANSMITTED FROM THE DESTINATION TO THE SOURCE.

Fig. 9A

Fig. 9B

